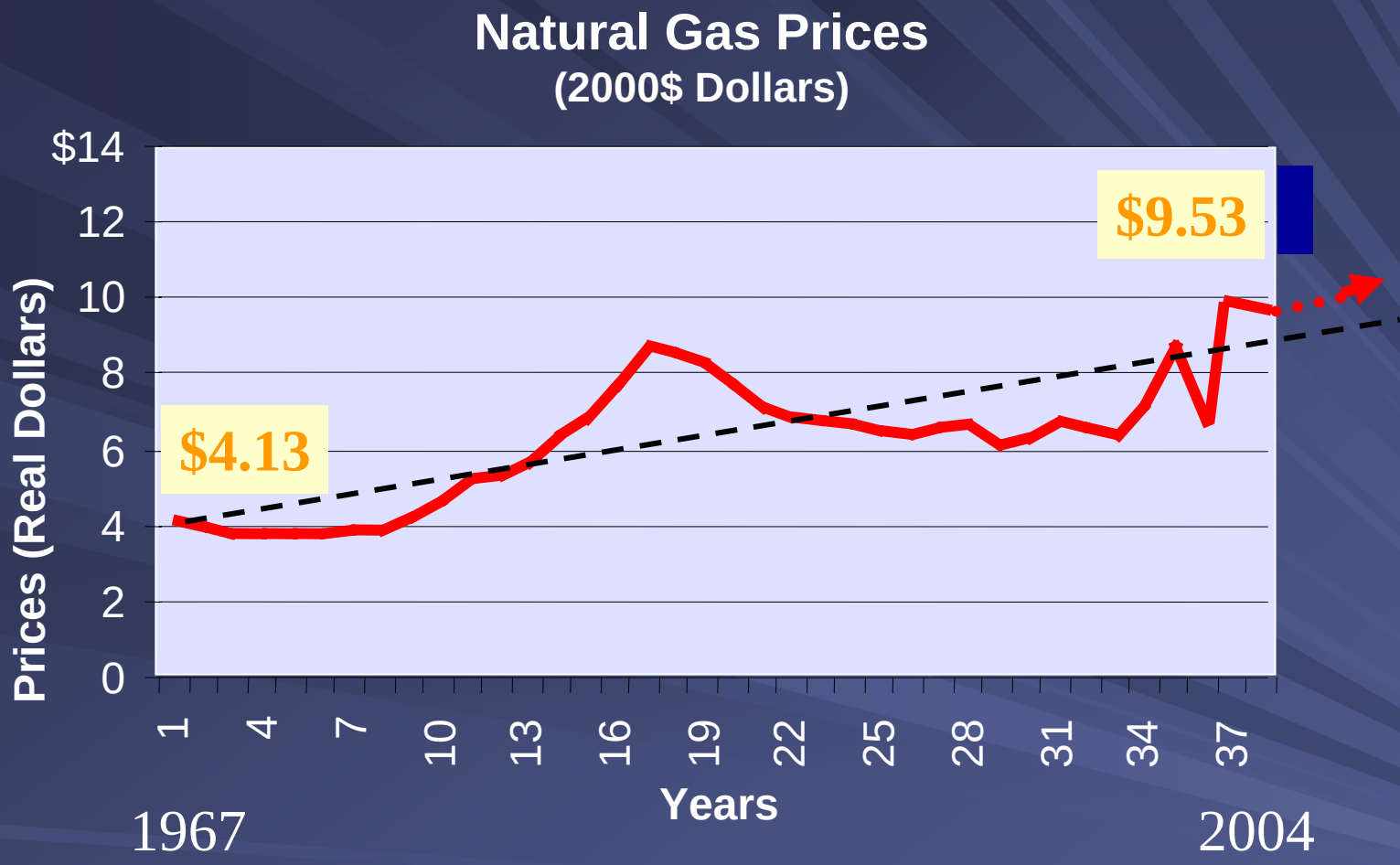
Community Power Corporation

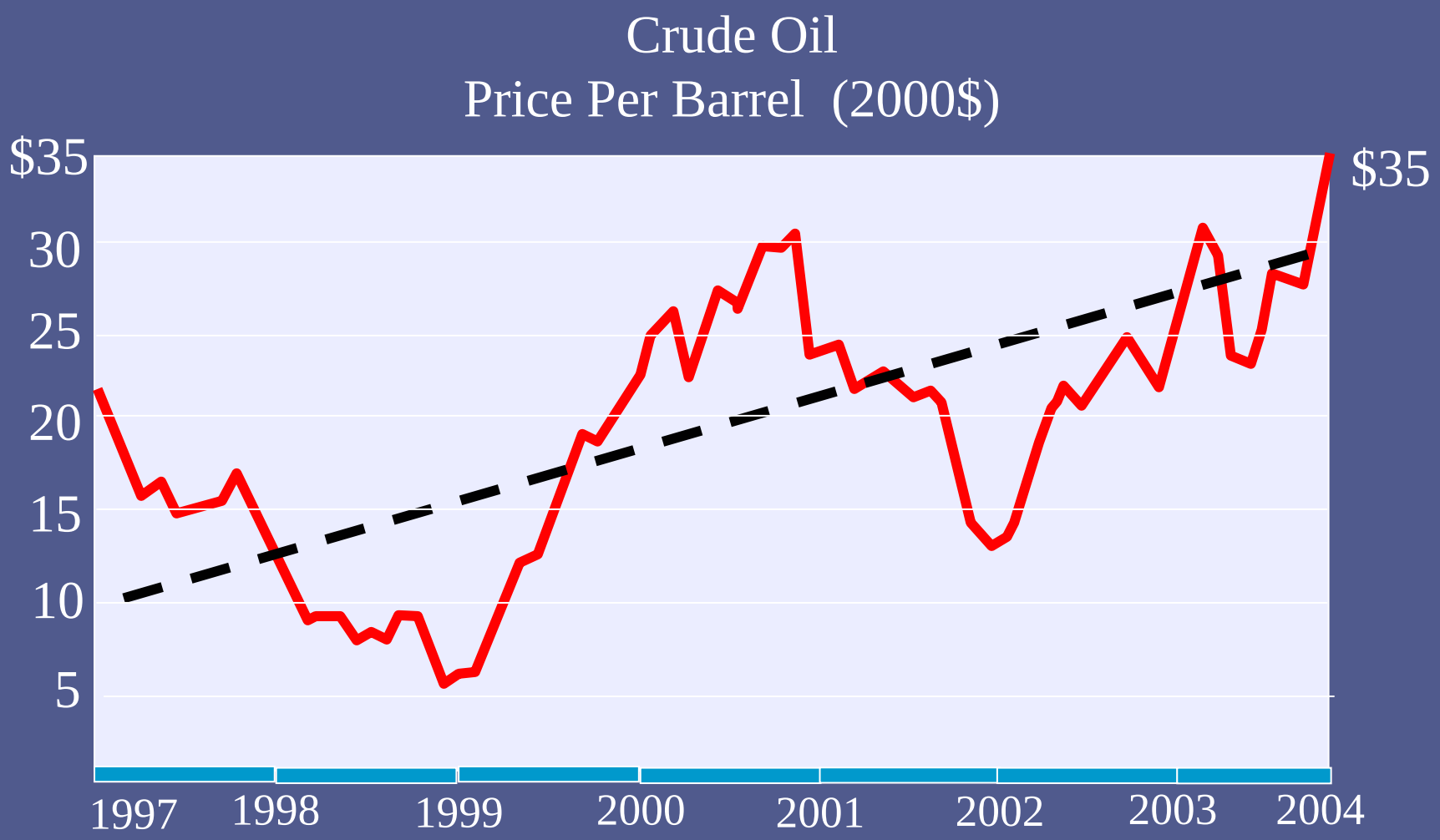
Energy Systems for Sustainable Power

Small Modular Biopower Systems

Sustainable Power For the 21st Century

Robb R. Walt
President


Natural Gas Prices
(2000$ Dollars)
Prices (Real Dollars)
$14
12
10
8
6
4
2
0
$9.53
$4.13
1
4
7
10
13
16
19
22
25
28
31
34
37
Years
1967
2004


Crude Oil
Price Per Barrel (2000$)
$35
30
25
20
15
10
5
$35
1997
1998
1999
2000
2001
2002
2003
2004

Small Biopower: In the Right Place, ……at the Right Time

Catastrophic Forest Fires

Healthy Forest Initiative = Forest Thinning Resources

War on Terrorism

Environment

Need for BioMax Systems

BLACKOUT

AUGU 2003

A BioMax will keep your lights on!

BioMax: Alternative To Fossil Fuel Gensets

Caption: *"Yeah, so what if diesel is $3.00/gal, whadaya think these things run on* ....wood?"

Primary Products: BioMax 5 to BioMax 50

World's first, fully automated, environmentally friendly, small modular biopower systems, designed for high volume, low cost manufacture

Uses wide variety of woody residues to provide power and heat for:

- Rural communities (US and foreign)
- Homes (net-metering, prime / back-up)
- Small enterprises (use on-site residues)
- Government facilities

Stand-alone Gas Generator for:

- Crop & wood drying (sawmills, wood working)
- Back-up for propane and/or natural gas
- Building heat (workshops, green houses, etc.)
- Cooling/chilling (buildings, food & crop preservation, etc.)

Why Small Biopower?

- ✓ Simple to site
- ✓ Uses on-site residues
- ✓ Fuel flexible
- ✓ Power flexible
- ✓ Simple to connect
- ✓ CHP capable
- ✓ Fully automatic
- ✓ Provides energy security
- ✓ Transportable
- ✓ Reliable: dual fuels

BioMax Fuels: Problem Woody Residues

(3 pounds per kilowatt-hour)

Wood-working Factory Residues

Coconut Residues - Philippines

Sawmill Residues

Forest Thinning Residues – USA (73M Acres)

CPC's BioMax Team

BioMax Biopower Systems

Founders/Owners
Art Lilley & Robb Walt

20 Years (each) Sr. Business Management & Technology Development for Westinghouse

Product Team – 18

Chief Scientist: Dr. Tom Reed (x-NREL)

Chief Engineer: Jim Diebold (x-NREL)

Product Development: King Browne

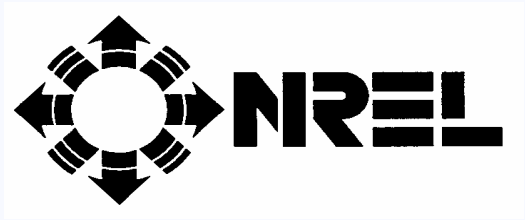
Senior Engineers: 2 (x-Westinghouse)

Engineers: 4

Technical staff: 6

Administrative: 3

Contributing Organizations to Develop BioMax



(DOE)

Shell Renewables & Foundation

CALIFORNIA ENERGY COMMISSION

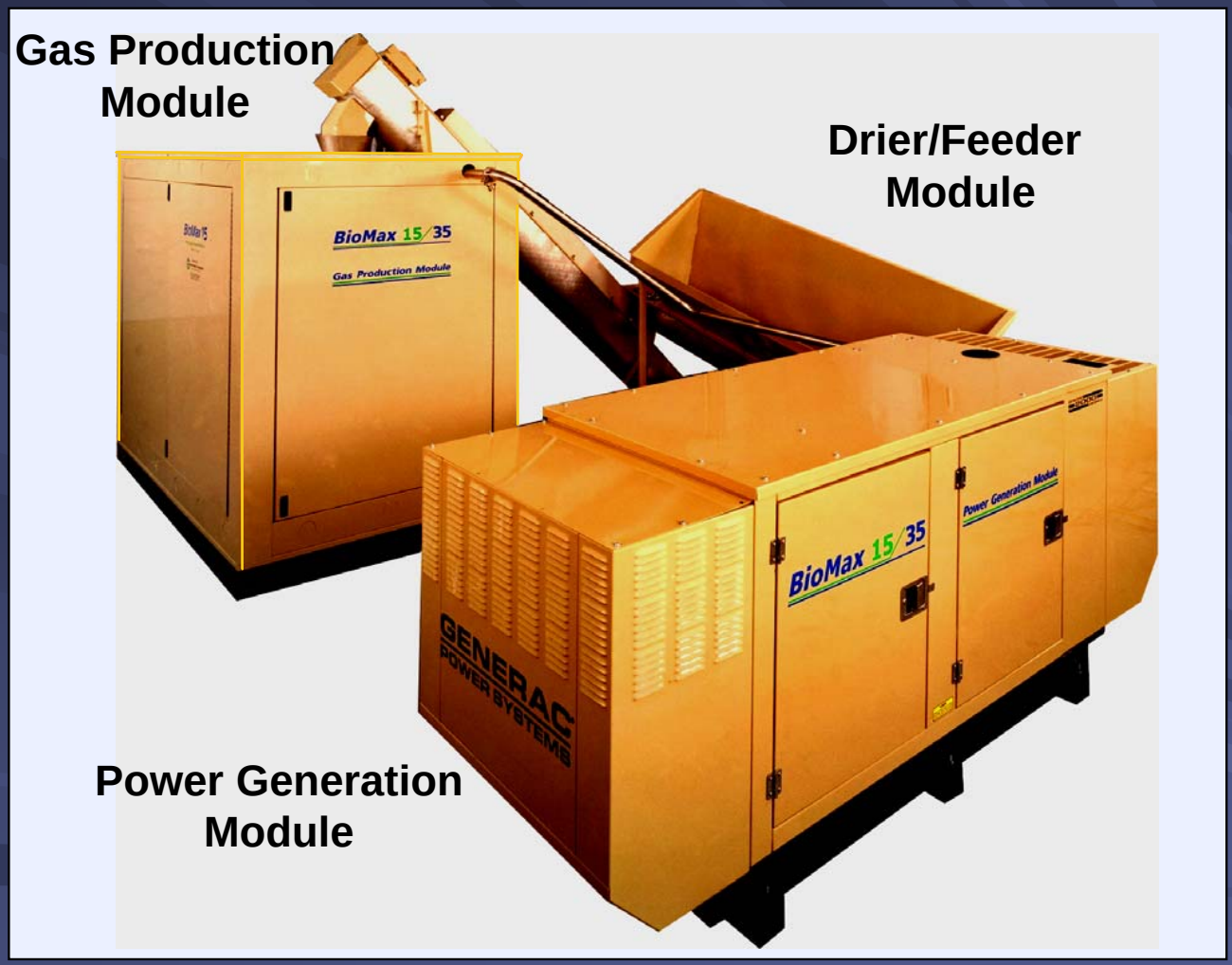
US FOREST SERVICE

CPC's Modular Biopower System

Sustainable Power for The 21st Century

- ✓ "Turn Key" - Fully automatic operation and control
- ✓ "Tar Free" - New gasifier design – simple gas cleanup
- ✓ No harmful emissions, no liquid effluents
- ✓ Simple design / low cost / easy manufacture
- ✓ Modular, easily transported, simple installation
- ✓ Power modules from 5 to 50 kW
- ✓ Grid interconnect and CHP capable

Primary Products: BioMax 5 to BioMax 50



Small Modular Biopower Systems for Homes, Enterprises and Rural Communities

CPC's New BioMax 50
California Energy Commission
Utility-grade Power For Distributed Generation (Mt. Shasta)

- ✓ Continuous 24hr Operation
- ✓ Automatic char & ash extraction
- ✓ Automated feeder/dryer
- ✓ Despatchable power (50 kW)
- ✓ Auto startup, monitoring & shutdown
- ✓ Grid interconnect
- ✓ Meets ARB emission standards
- ✓ Maintenance less than 3 hours/week
- ✓ Prime power rated

CPC's BioMax 5
Home Biopower System

Utility-grade power (and heat) for homes, offices & small enterprises

Features:

- Capacity: 5 kWe; 110/220VAC; 60/50 Hz
- Fuels: wood pellets & chips, nut shells, propane
- Energy: 10 –30 kWh/day
- 24 hour AC power
  - biopower operation – 4-6 hr/day
  - battery/inverter - 24 hr/day
- Automatic operation

Advantages:

- Lower cost than PV or wind systems
- Uses waste wood or pellets as fuel
- Provides power and heat
- Utility-grade power, 24/7

Community Power Corporation

NREL

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CPC's BioMax:
A Versatile, Bioenergy Gas Generator

BioMax

Converts forest/ag residues to a gas capable of fueling a variety of power generation and heating/cooling technologies

RUNS:

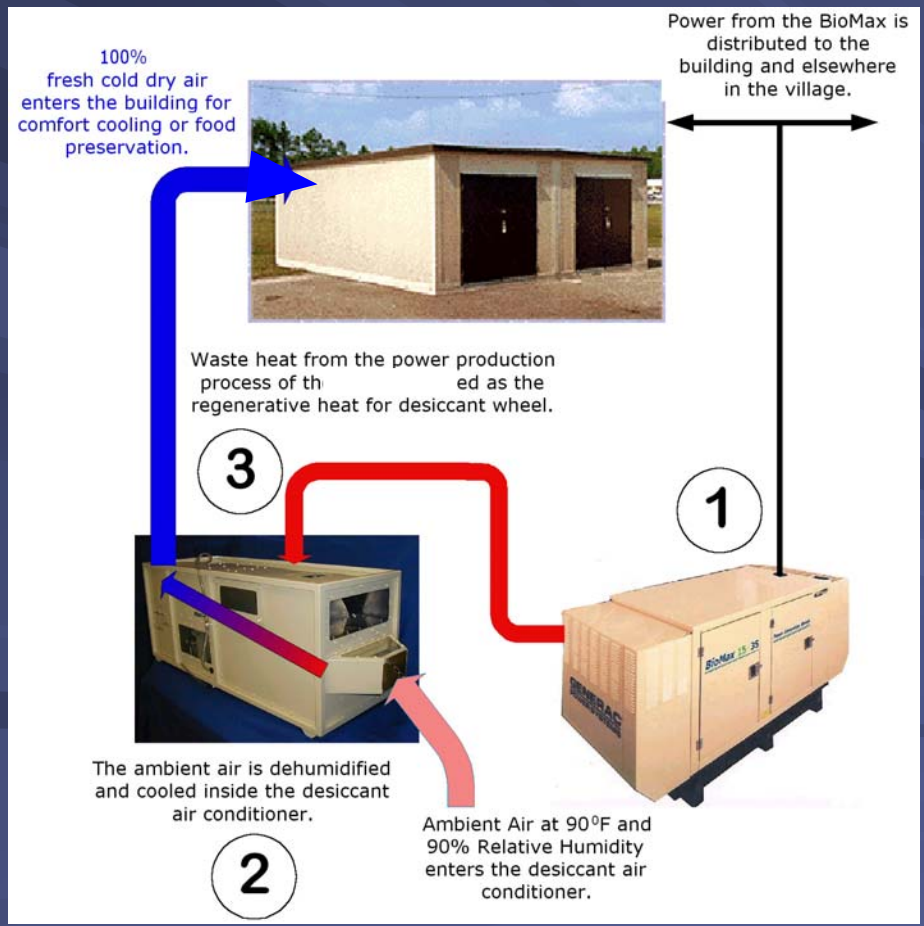
- **IC Engines**
- **Stirling Engines**
- **Fuel Cells**
- **Microturbines**
- **Furnaces Driers/Chillers**

CPC's BioMax: Power + Heat and Cooling

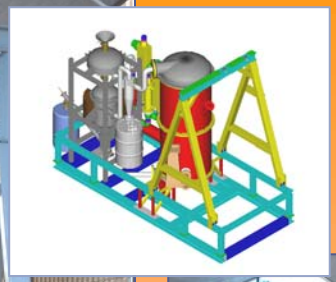
Turns Hot or Hot & Humid into Cool and Dry

Idalex's Multistage Evaporative Cooling System

No compressor, fraction of the power, produces 55 degree air



BioMax Power Systems
For Poultry Farms



On-site Electricity & Heat
From Poultry Farm Residues

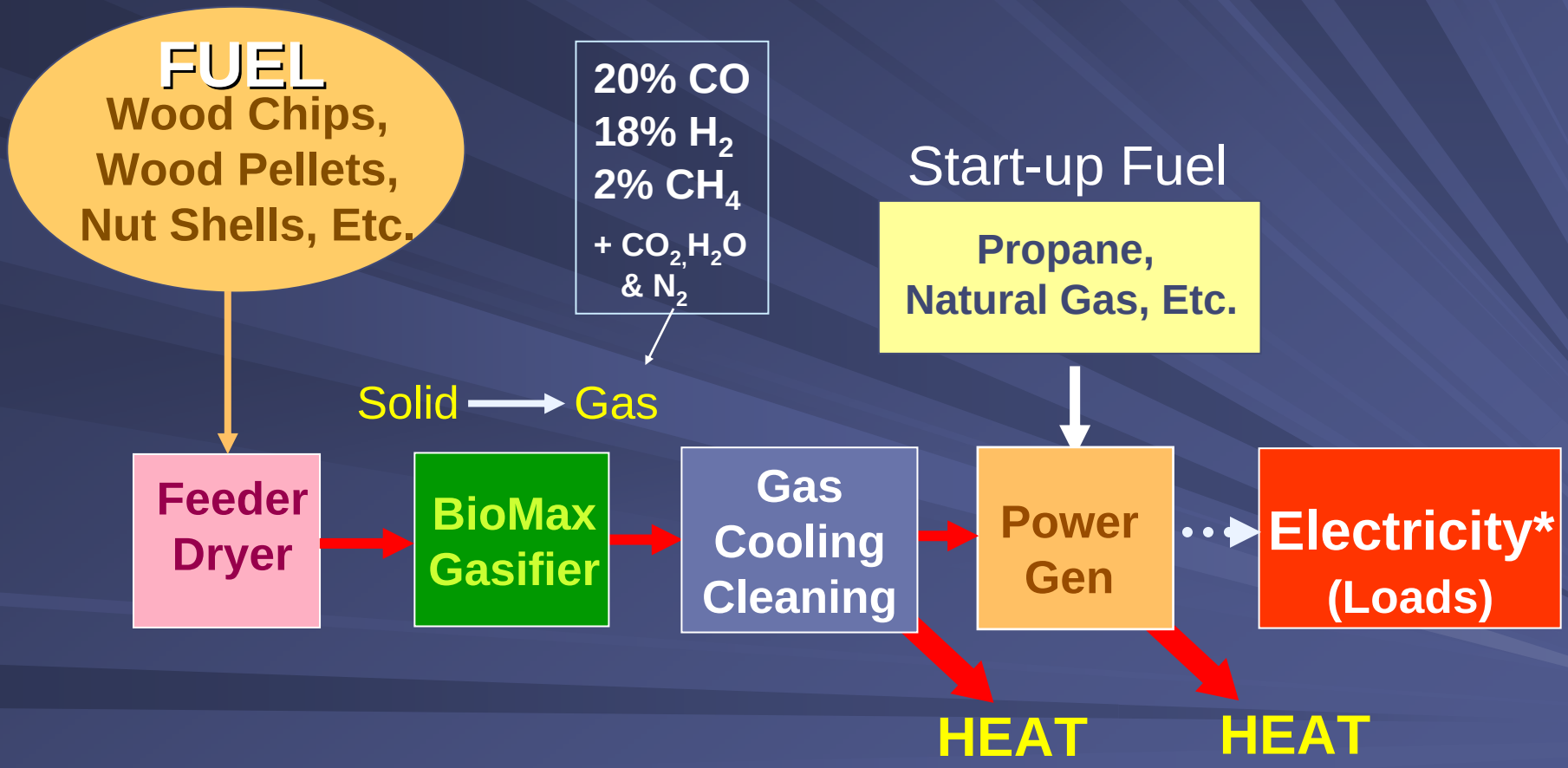
Features

- Automatic startup, operation & shutdown
- Microprocessor-based control system
- Co-Gen (CHP) power modules
- Dry gas clean-up, No wet scrubber
- No liquid effluents, No toxic wastes
- Designed for Poultry Litter & Fuel Flexible: (straw, rice hulls, switchgrass, sawdust)
- Optional automatic dryer/feeder
- Design scalable for small and large farms
- Trailer or skid mounted, simple installation

Specifications

- Electrical Power: 20 to 250 kWe modules
  Thermal : ~0.4 to 5 Million Btu/h
- Footprint: 2.5m x 5.5m
- Weight: depending on unit, ~5T
- Gas: LHV >4 MJ/$m^{3,}$ <10 ppm Tars/Particulates
- Litter to Power Conversion: ~2 dry T/MWh
- Litter to Fuel Gas: > 90 gal LPG equiv/dry T
- Dispatchable power in 30s available
- Gasifier cold startup: ~60 minutes
- Load balancing: Brooder heat, power, flare
- Dry gas composition: 0_2 0%, H_2 12.5%
  CO 12.5%, CO_2 18%, CH_4 5%, balance is N_2
- Startup/Backup fuel: LPG

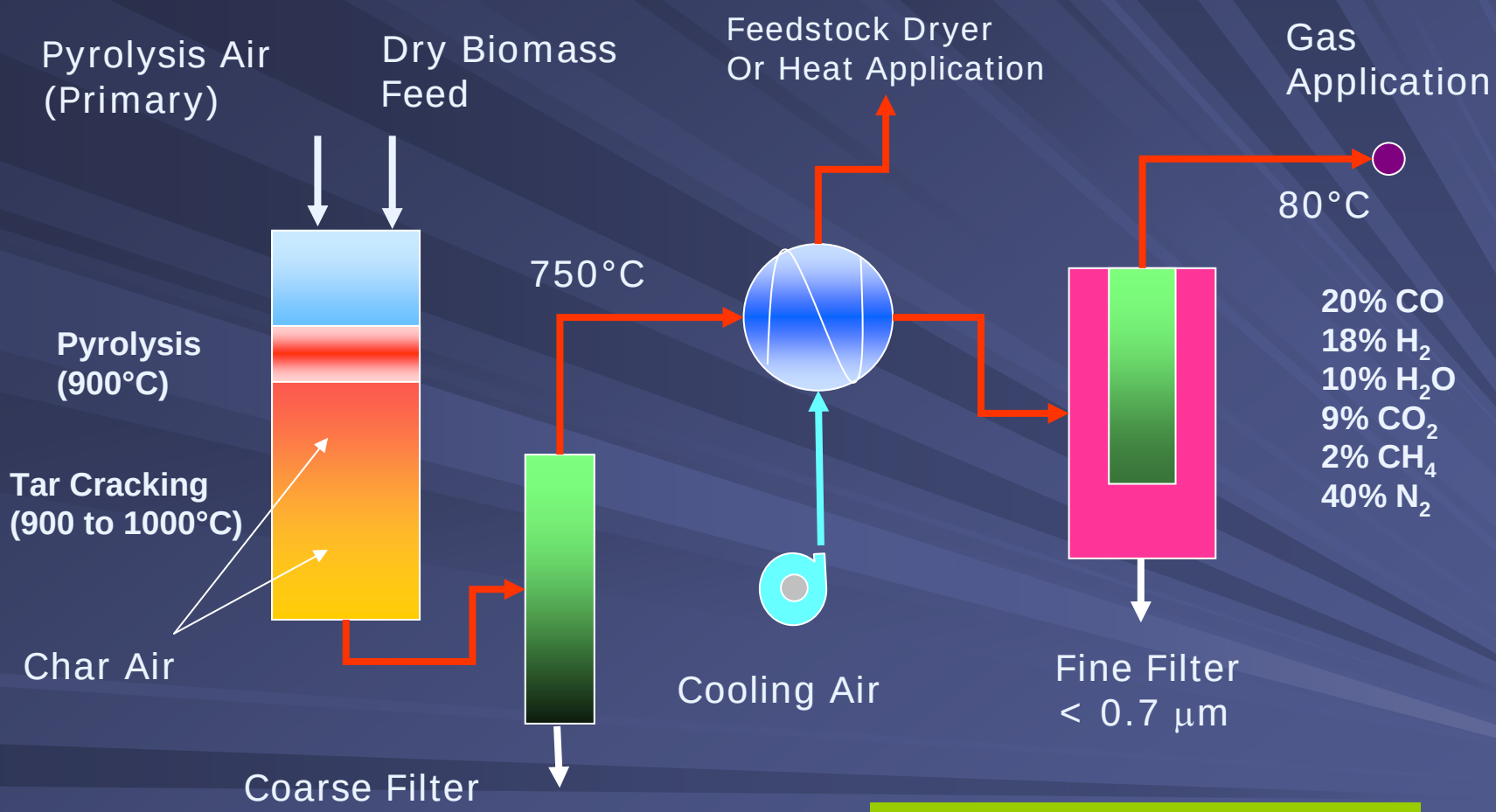
BioMax: Gasification Converts Woody Materials to a Clean Fuel Gas for Heat, Power and Cooling



Wood Energy Conversion Efficiency: 80%
System CH&P Efficiency = +70%

* and/or shaft power

CPC's Direct Air Gasification



3 lbs wood = 1 kWh

~70% of Biomass Energy = Chemical Fuel
~20% of Biomass Energy = Recoverable Heat, Gas Cooling

Biomass Fuels for Current BioMax*

Tested	Potential	Problematic

• All kinds of wood
• Any kind of pellet
• Most nut shells
  - coconut shells
  - pecan shells
  - walnut shells
  - nutmeg shells
  - pistachio shells
  - palm oil shells
• Corn (tainted)
• Poultry litter
• Tennis Shoe Factory Wastes
	• Cubed grasses
	• Dried cakes
	  - ethanol
	  - canola
		• Rice husks
		• Corn stover
		• Sawdust
		• Sugar cane leaves
		• Straw

*Downdraft Model

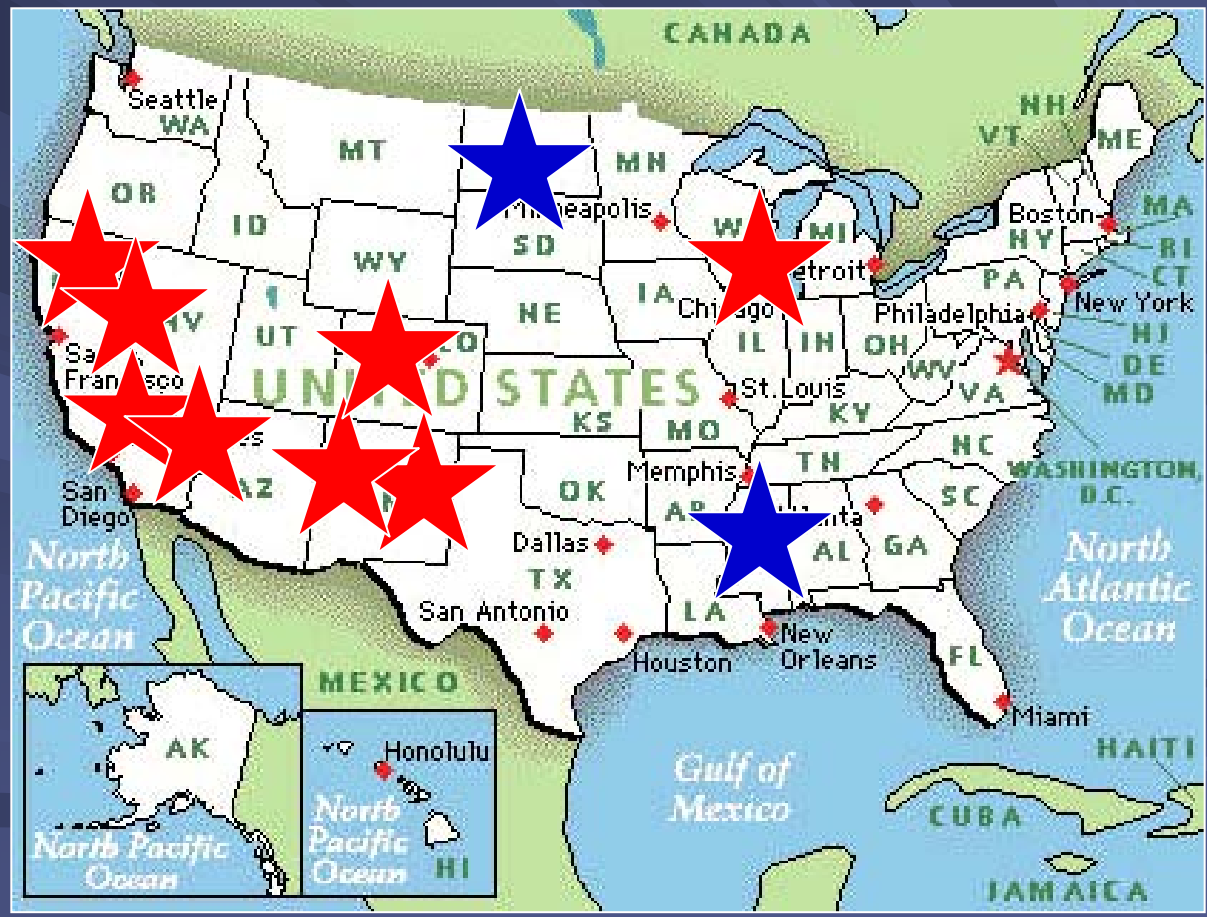
CPC Projects

US Forest Service/NREL	**5 BioMax power systems deployed in USA**
Mississippi State University	**BioMax for Bio-reactor – Ethanol – MSU**
Philippines – USAID/WB	**Rural Electrification and Enterprises BioMax & C-PUP**
State of California	**New 50 kW 24/7 Grid Interconnected BioMax**
USDOE- Crop Drying	**New R&D Project to adapt CPC gasifiers for commercial crop drying**
Excel Energy - Gas Conditioning	**R&D Project to develop new centrifugal filter for BioMax systems**

BioMax 5,15, 50
Development & Demonstration Projects
(USFS + NREL + CEC + CPC)

Sites

- Ruidoso, NM
- Zuni, NM
- Walden, CO
- Mt. Shasta, CA
- San Bernadino, CA
- Big Bear Lake, CA
- Truckee, CA
- Madison, WI
- Starkville, Ms
- Grand Forks, ND



BioMax Applications:

Wood-fueled, On- or Off-Grid Power and Heat for Homes, Small Enterprises and Organizations

Woodworking Shops




Manufactured Wood Homes


Greenhouses

Rural Schools & Offices

Post & Pole Companies


Wood Flooring Companies

Community Power Corporation's
BioMax 15 Modular Biopower System

BioMax 15 Biopower System
SBS Wood Shavings Company
Ruidoso, New Mexico

BioMax 15 System

Automatic Control System

Wood Chip Feeder/Drier

- Application:Power & heat for wood shavings company
- Fuel: Wood scraps and forest thinning residues
- Operation: Daily
- Wood Consumption: 3 lbs/kWh
- Daily Load: 12 to 15 kW, 80-120 kWh
- Maintenance: 30 minutes per week
- Installation: October 2003
- Advantage: Reduces costs of electricity and propane for heat
  Provides "green" marketing advantage for company

Community Power Corporation's
BioMax 15 Modular Biopower System

BioMax 15 Biopower System
Zuni Furniture Enterprises

Zuni, New Mexico

Zuni Furniture Company

Zuni Workshop

BioMax 15 at Zuni

- Application:Power & Heat Furniture making shop
- Fuel: Wood scraps and forest thinning residues
- Operation: Daily
- Wood Consumption: 3 lbs/kWh
- Daily Load: 8 to 12 kW, 60-80 kWh
- Maintenance: 30 minutes per week
- Installation: October 2003
- Advantage: Disposes of on-site wood wastes and reduces costs of electricity and propane for heat

Community Power Corporation's
BioMax 15 Modular Biopower System

BioMax 15 Biopower System
North Park High School
Walden, Colorado

Power & Heat For Greenhouse

Strong Community Support

BioMax 15 – Operated by Students

- Application: Power & Heat for High School Vocational Horticulture Program
- Fuel: Forest thinning residues
- Operation: Daily by high school students
- Wood Consumption: 3 lbs/kWh
- Daily Load: 6 to 8kW, 40-80 kWh
- Maintenance: 30 minutes per week
- Installation: September 2003
- Advantage: - Reduces costs of electricity and propane for heat
  - Provides students with hands-on learning experience about renewable energy and biopower

CPC's New BioMax 50 - Power and Heat For the Big Bear Discovery Center San Bernardino Forest

March 2005

- Power and heat from forest thinnings –1 ton/day
- Automatic operation
- Meets current CARB emission standards
- Grid interconnected
- Demonstrate to the public the high value of forest resources

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